IN THE CLAIMS:

Please cancel claims 104, 108 and 109.

85. (Amended) A method for locating a terrestrial mobile station, MS, when there is an occurrence of at least one of (A) and (B) following: (A) said terrestrial mobile station MS [is] being tracked, and (B) a request for locating said terrestrial mobile station MS, wherein said method uses wireless signal measurements obtained from transmissions between said terrestrial mobile station MS and a plurality of terrestrial communication stations, each capable of at least one of: wirelessly detecting said terrestrial mobile station MS, and wirelessly being detected by said terrestrial mobile station MS, comprising:

providing access to first and second mobile station location estimators, wherein said location estimators provide likely geographical ranges of an unknown location [estimates] of said mobile station MS when said location estimators are each supplied with corresponding input data obtained from wireless signal measurements obtained from transmissions between said mobile station MS and the communication stations;

wherein said first location estimator performs one or more of the following techniques (a) through [(c)] (d) when supplied with said corresponding input data:

(a) an angulation technique for determining, for at least one of the communication stations, at least one of (i) and (ii) following: (i) a distance between the communication station and the mobile station MS, said distance dependent upon signal time delay derived information as at least part of said corresponding input data, and (ii) a wireless signal angle of arrival between the mobile station MS and the communication station, wherein said at least one communication station is stationary;

(b) a learning technique, wherein said learning technique uses a learned [learns an] association for associating (b1) and (b2) following:

(b1) information, in said corresponding input data, obtained from at least one of signal strength and signal time delay measurements

of wireless signal communicated between the mobile station MS and the communication stations, and

(b2) data identifying a likely geographical range for a location for the mobile station MS,

wherein said association is learned by a training process using a plurality of data pairs, each said data pair including: first information identifying a known location of some mobile station, and second information from wireless signal measurements communicated between said some mobile station and one or more of the communication stations when said some mobile station is at the known location;

(c) a stochastic technique, wherein said stochastic technique uses a statistical correlation for correlating (c1) and (c2) following:

(c1) information, in said corresponding input data, obtained from at least one of signal strength and signal time delay measurements of wireless signal between the mobile station MS and the communication stations, and

(c2) data identifying a likely geographical range for a location for the mobile station MS,

wherein said correlation is used for determining a probability that the mobile station MS is within the likely geographical range of (c2) [an area];

(d) a multipath resolution technique for determining a likely geographical range L for a location of the mobile station MS, wherein for determining L, (d1) - (d3) following hold:

(d1) the multipath resolution technique is dependent upon multipath data of the corresponding input data, wherein the multipath data is obtained from wireless signal multipath information communicated between the mobile station MS and the communication stations,

(d2) the multipath resolution technique is dependent upon (i) and (ii) following: (i) a representation of each of a plurality of

geographical locations and (ii) for each of the geographical locations, corresponding multipath information previously obtained using transmissions between some mobile station and the communication stations, when the some mobile station ~~transmited~~ transmitted from approximately the geographical location,

(d3) the multipath resolution technique selects one or more of the geographical location representations that are likely to be approximate to the unknown location;

first receiving, from said first location estimator, in response to first supplying said first location estimator with its said corresponding input data for said at least one occurrence, first location related information having at least a first [estimate] likely geographical range for a location of the mobile station MS;

second receiving, from said second location estimator, in response to second supplying said second location estimator with its said corresponding input data for said at least one occurrence, second location related information having at least a second [estimate] likely geographical range for the location of the mobile station MS;

wherein each of said first and second likely geographical ranges [location estimates] is [generated] determined in a manner that is substantially unaffected by the likely geographical range [independently] of the other of said first and second location estimators [estimate];

determining a resulting location estimate of the mobile station MS that is dependent upon (a) and (b) following: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information.

86 (Amended) The method as claimed in Claim 85, further including:

first supplying said first location estimator with its said corresponding input data for said at least one occurrence; and

second supplying said second location estimator with its said corresponding input data for said at least one occurrence;

wherein at least one of said steps of first and second supplying, first and second receiving uses a transmission on the Internet.

88. (Amended) The method as claimed in Claim 85, wherein said step of providing access includes transmitting, through a telecommunications network, said first location estimator from a source site to an activation site for generating said first likely geographical range [performing said step of first generating].

90. (Amended) The method as claimed in Claim 85, further including a step of retrieving at least one of (d) and (e) following:

(d) first historical location data having (i) and (ii) following:

(i) a first set of previous likely geographical ranges for one or more mobile station locations [estimates] generated by said first location estimator using first data obtained from wireless signal measurements of transmissions between: (1) one or more of a plurality of mobile stations, at a first plurality of locations, and (2) said plurality of communication stations, wherein said first set is selected by determining that a distance related between at least one of said previous likely geographical ranges [location estimates] of said first set, and said first [estimate of] likely geographical range for the location of the mobile station MS has a predetermined relationship, and

(ii) data identifying said locations of said first plurality of locations; and

(e) second historical location data having (iii) and ([ii]iv) following:

(iii)[(i)] a second set of previous likely geographical ranges for one or more mobile station locations [estimates] generated by said second location estimator using second data obtained from

wireless signal measurements of transmissions between: (1) one or more mobile stations at a second plurality of locations, and (2) said plurality of communication stations, wherein said second set is selected by determining that a distance between at least one of said previous likely geographical ranges for one or more mobile station locations [estimates] of said second set, and said second [estimate of] likely geographical range for the location of the mobile station MS is [determined to be] less than a second predetermined value, and

(iv) [(ii)] data identifying said locations of said second plurality of locations.

91. (Amended) The method as claimed in Claim 85, further including, for at least one of said first and second likely geographical ranges [location estimate of said first and second location estimates], a step of obtaining a likelihood value that the at least one likely geographical range [location] of said mobile station MS includes said mobile station MS [is in said one location estimate], wherein said likelihood value is obtained using previous likely geographical ranges for one or more mobile station locations [estimates] generated by the location estimator that generated said at least one likely geographical range [location estimate].

92. (Amended) The method as claimed in Claim 85, wherein said step of providing access includes providing a third mobile station location estimator, wherein said third mobile station location estimator generates a likely geographical range [an estimate] of where said mobile station MS is unlikely to be located.

93. (Amended) The method as claimed in Claim 85, wherein said wireless signal measurements are measurements of transmissions between said mobile station MS and said plurality of communication stations, wherein for providing a single

instance of said corresponding input data to one of said location estimators, said transmissions occur within an interval of time that is less than a predetermined duration.

94. (Amended) The method as claimed in Claim 85, further including performing a first simulation for predicting a likelihood of said mobile station MS being in [at] said first likely geographical range [location estimate], wherein said simulation uses pairs of location representations, a first member of each pair including a likely geographical range [location estimate] obtained from said first location estimator for locating [of] a different mobile station, and a second member of the pair including a representation of an independently determined location of the different mobile station

97. (Amended) A method for [locating] estimating, ~~for each mobile station~~ MS of a plurality of mobile stations, [mobile station] at an unknown terrestrial location, L, for MS using wireless signal measurements obtained from transmissions between said mobile station MS and a plurality of fixed location terrestrial communication stations, wherein each of said communications stations is substantially co-located with [includes] one or more of a transmitter and a receiver for wirelessly communicating with said mobile station MS, comprising:

initiating one or more requests for information related to [a] the location of said mobile station MS [from] with one or more mobile station location evaluators such that when said location estimators are supplied with input data having values obtained from wireless signal measurements obtained via transmissions between said mobile station MS substantially at L, and the communication stations, said one or more location evaluators perform at least two of the following techniques (i), (ii) and (iii) when said techniques are supplied with a corresponding portion of said input data:

(i) a first technique for estimating [a location of] where said mobile station MS is located using signal time delay values from a first corresponding portion of said input data obtained from signals received at the mobile station MS from one or more satellites, wherein said first technique uses said signal time delay values for determining one or more distances between said mobile station MS and said one or more satellites;

(ii) a second technique for recognizing [a pattern of] multipath characteristics of a second corresponding portion of said input data, wherein said second technique includes the steps of (a) and (b) following[uses an association for associating, for each of a plurality of mobile station locations, multipath wireless signal characteristics between: (a) one or more of the communication stations, and (b) a mobile station at the location]:

(a) calibrating, for each of a plurality geographical locations, (a1) and (a2) following: (a1) a representation of the geographical location, and (a2) for the geographical location, corresponding multipath information indicative of multipath signals previously transmitted between some mobile station and the transceivers, when the some mobile station transmitted from approximately the geographical location;

(b) determining one or more likely location estimates for MS by identifying a similarity between (b1) and (b2) following: (b1) multipath characteristics determined from wireless signals communicated between the mobile station MS and the transceivers, and (b2) the multipath information of (a2) for a collection of one or more of the geographical locations; and

(iii) a third technique, wherein said third technique uses a statistical correlation for correlating (a) and (b) following:

(a) values of [said] a third corresponding portion of said input data for the third technique, wherein said values are a function [indicative] of at least one of: a signal strength and a signal time delay of wireless signals between said mobile station MS and the communication stations, and

(b) information indicative of: a plurality of collections of wireless signal measurements, wherein for each said collection, there is a known location S where said collection is obtained from transmissions between said communication stations and some mobile station at the location S for said some mobile station[,];

wherein said correlation is used for determining [a likelihood] that the mobile station MS is within a corresponding geographic area;

first obtaining at least a first location estimate of said mobile station MS, from said one or more location estimators[, a first one or more estimates] using a

[supplied] first instance [one or more] their said corresponding portions of said input data [for at least a first time when said first one or more corresponding portions are available];

wherein said step of first obtaining requires two way communication between the mobile station MS and at least one of the communication stations prior to performing any of said first, second and third techniques;

transmitting, to a predetermined destination via a communications network, [a] resulting information related to the location L [estimate] of said mobile station MS, [that is] wherein said resulting information is obtained from said first one or more location estimates.

98 (Amended) The method of Claim 97, further including the following steps:

second obtaining, from said one or more location evaluators, a second one or more location estimates using a supplied second one or more of said corresponding portions of said input data [for at least one of: said first time and a second time when said second one or more corresponding portions are available];

determining said resulting location estimate of the mobile station, wherein said resulting location estimate is dependent upon: (a) a first value obtained from said first one or more location estimates, and (b) a second value obtained from said second one or more location estimates.

99. (Amended) A method for locating [a] mobile stations at one or more unknown terrestrial locations using wireless signal measurements obtained from transmissions between said mobile stations and a plurality of fixed location terrestrial communication stations, wherein each of said communications stations includes one or more of a transmitter and a receiver for wirelessly communicating with said mobile stations using one of the following wireless transmission techniques: CDMA, TDMA, GSM, AMPS, and NAMPS, comprising:

providing [initiating one or more] a plurality of requests for location information, each request related to a location of one of said mobile stations, to [from] one or more mobile station location [evaluators] estimators such that when said location estimators are supplied with input data having values obtained from wireless signal measurements obtained via transmissions between said mobile stations and the communication stations, said one or more location [evaluators] estimators perform at least two of the following techniques (i), (ii), [and] (iii) and (iv) [when said techniques are supplied with a corresponding portion of said data]:

(i) a first technique for estimating [a] locations of said mobile stations, wherein for each mobile station MS1 of at least some of the mobile stations, the first technique estimates a location of MS1 using signal time delay values from a first corresponding portion of said input data obtained from signals received at the mobile station MS1 from one or more satellites, wherein said first technique uses said signal time delay values for determining one or more distances between said mobile station MS1 and said one or more satellites;

(ii) a second technique for recognizing a pattern of characteristics of a second corresponding portion of said input data, wherein said second technique uses an association for associating, for each of a plurality of mobile station locations, multipath wireless signal

characteristics between: (a) one or more of the communication stations, and (b) [a] one of the mobile stations at the location; and

(iii) a third technique for determining locations of said mobile stations, wherein for each mobile station MS3 of at least some of the mobile stations, and for at least a corresponding one of the communication stations CS that is responsive to transmissions from the mobile station MS3 , one of (a) and (b) following: (a) a distance between the communication station CS and the mobile station MS3, said distance dependent upon measurements of a time delay of signals transmitted between the mobile station MS3 and [at least one of] the communication station[s] CS, said measurements obtained from a third corresponding portion of said input data, and (b) a wireless signal angle of arrival indicative of an angular orientation about the communication station CS of a direction of the wireless transmissions to CS from MS3 [between the mobile station MS3 and the communication station];

(iv) a fourth technique for determining likely locations of the mobile stations, wherein for each mobile station MS4 of at least some of the mobile stations, (a) - (c) following hold:

(a) the fourth technique is dependent upon multipath data of a fourth corresponding portion of said input data, wherein the multipath data is obtained from wireless signal multipath information communicated between the mobile station MS4 and the communication stations,

(b) the fourth technique is dependent upon (b1) and (b2) following: (b1) a representation of each of a plurality of geographical locations and (b2) for each of the geographical locations, corresponding multipath information previously obtained using transmissions between some mobile station and the

communication stations, when the some mobile station transmitted from approximately the geographical location,

(c) the fourth technique selects one or more of the geographical location representations that are likely to be approximate to at least one unknown location of the mobile station MS4;

first obtaining, in response to one of the requests, at least a first location estimate of a first of said mobile stations, from said one or more location estimators[, a first one or more estimates using] by performing a [supplied] first collection of one or more of said first, second, third and fourth techniques using an available instance of [one or more] said corresponding portions of said data for the first mobile station at a first unknown location[for at least a first time when said first one or more corresponding portions are available];

second obtaining, in response to another of the requests, at least a second location estimate of a second of said mobile station, from said one or more location estimators by performing a second collection, different from said first collection, of one or more of said first, second and third techniques when there is an available instance of their said corresponding portions of said data for the second mobile station at a second unknown location;

first transmitting, to a first [predetermined] destination via a first communications network, [a] first resulting information related to the location [estimate] of said first mobile station [that is] wherein said first resulting information is obtained [from]using said first[, one or more] location estimate[s];

second transmitting to a second destination via a second communications network, second resulting information related to the location of said second mobile station, wherein said second resulting information is obtained using said second location estimate.

100. (Amended) A location system for determining a location of [locating] a mobile station MS, wherein said mobile station is one of a plurality of mobile stations, and signal measurements are available of wireless transmissions between the plurality of mobile stations and a plurality of [fixed location] terrestrial communication stations, the improvement characterized by:

one or more location estimators, each said location estimator for estimating a likely geographical region of a location for each of one or more individual mobile stations of the plurality of mobile stations, when said location estimator is supplied with data obtained from a set of said wireless signal measurements provided by wireless transmissions between the individual mobile station and at least one of said plurality of [fixed location] communication stations;

an archive for storing a plurality of data item collections, wherein for each geographical location of a plurality of geographical locations, there is one of said data item collections having (a1) and (a2) following:

(a1) a representation of the geographical location, and

(a2) data obtained from wireless signal measurements provided by one of the plurality of mobile stations transmitting from approximately the geographical location of (a1);

a performance evaluator for determining, for at least one of said location estimators, ESTR, a corresponding one or more performance measurements indicative of a previous performance of said one location estimator ESTR in locating one or more of the plurality of mobile stations, wherein said corresponding performance measurements are determined using said data item collections;

a controller for activating a group of at least one of said location estimators, having ESTR therein, wherein (b1) and (b2) following:

(b1) [for generating] ESTR outputs a corresponding likely geographical location LE of an unknown location [estimates] of said mobile station MS when ESTR is activated with a first said set of wireless signal measurements provided by wireless transmissions between said mobile station MS and at

least one of said plurality of [fixed location] communication stations is obtained, and

(b2) the likely geographical location LE has [wherein one or more location hypotheses are generated, each having (b1) and (b2) following:

(b1) a location estimate, of said mobile station that is dependent upon one of the corresponding location estimates generated by one of the location estimators of said group, and

(b2)] a corresponding likelihood value indicating a likelihood of said mobile station MS being at a location represented by LE [said hypothesized location estimate of (b1)], wherein said one or more corresponding performance measurements for said one location estimator ESTR [providing the location estimate of (b1)] are used in determining said corresponding likelihood value;

a location [estimator] determiner for determining [a] resulting location information for [estimate of] said mobile station MS, wherein said location determiner uses LE to obtain the resulting location information [resulting location estimate being derived using at least one of said hypothesized location estimates, and said corresponding likelihood values from said one or more location hypotheses].

101. (Amended) A method for determining a location of [locating] a mobile station, MS, wherein said mobile station MS is one of a plurality of mobile stations, and signal measurements are capable of being obtained from wireless transmissions between the plurality mobile stations and a plurality of fixed location communication stations, each of said communication stations capable of at least one of: wirelessly detecting said mobile station MS, and wirelessly being detected by said mobile station MS the improvement characterized by:

providing access to a mobile station location estimator for estimating, for each of one or more of said mobile stations, a location of the mobile station when said location estimator is supplied with corresponding input data obtained using said signal measurements obtained from wireless transmissions between the mobile station and said plurality of communication stations;

storing a plurality of data [item] collections, wherein for each of a plurality of geographical locations, there is one of said data [item] collections having (a1) and (a2) following:

(a1) a representation of the geographical location, and

(a2) a representation of said signal measurements between one of the mobile stations and the plurality of communication stations when said one mobile station is approximately at the geographical location of (a1);

first obtaining, from said signal measurements between said mobile station MS and said plurality of communication stations, an initial location estimate of said mobile station MS from said location estimator;

second obtaining one or more additional location estimates generated by said location estimator, wherein each said additional location estimate is generated from input supplied from at least one of said representations of signal measurements of (a2) for at least one of said data [item] collections, and wherein at least a majority of said additional location estimates satisfy a predetermined constraint dependent on said initial location estimate;

deriving a further location estimate of said mobile station MS using a group of one or more of said geographical location representations of (a1) for said data [item] collections whose representations of signal measurements of (a2) were used to generate one of said additional location estimates.

102. (Amended) The method as claimed in Claim 101, wherein said step of deriving includes determining an area boundary of said further location estimate as a function of said geographical location[s] representations in said group.

103. (Amended) A location system for locating a mobile station MS using wireless signal measurements obtained from transmissions between said mobile station MS and a network of [fixed location] transceivers, wherein said transceivers are cooperatively linked for use in locating the mobile stations, the improvement characterized by:

a communications interface for routing, to each of one or more location estimators, corresponding input data for estimating one or more initial locations of said mobile station MS, wherein said corresponding input data is obtained using measurements of wireless signals obtained from transmissions between:

(i) the mobile station MS, at a corresponding geographical location, and

(ii) the network of transceivers;

a location estimate adjuster for deriving an additional location estimate of said mobile station MS using a first initial location estimate generated by a first of said location estimators, wherein:

(a1) said additional location estimate has a corresponding confidence value indicative of a likelihood of the geographical location of the mobile station MS being at a location represented by said additional location estimate, and

(a2) said additional location estimate is determined using other location estimates generated by said first location estimator previously to the generation of said first initial location estimate, wherein said other location estimates are within a predetermined area about said first initial location, and said additional location estimate is determined using known locations corresponding to said other location estimates; and

an output gateway for transmitting, to a predetermined destination, a resulting location estimate that is dependent upon one or more of said first initial location estimate and said additional location estimate.

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105. (Amended) The location system, as claimed in Claim 103, further including a most likely estimator for determining said resulting location estimate of the corresponding geographical location of the mobile station MS, said [most likely]

resulting location estimate being derived using said additional location estimate and its corresponding confidence value, said most likely estimator includes a probability density function for fuzzifying at least said confidence value for said additional location estimate over an area adjacent a boundary of said additional location estimate.

106. (Amended) A location system for locating mobile stations using wireless signal data obtained from transmissions between said mobile stations and a network of fixed location transceivers, wherein said transceivers [in the network] are cooperatively linked for use in locating said mobile stations, the improvement characterized by:

an archive for storing a plurality of data [item] collections, wherein for each of a plurality geographical locations, there is one of said data [item] collections having (a1) and (a2) following:

(a1) a representation of the geographical location,

(a2) a set of said wireless signal data obtained using transmissions between one of said mobile stations and the network, wherein the one mobile station transmits from approximately the geographical location of (a1);

a plurality of location estimators, one or more of which are [trainable] adaptable, wherein each said [trainable] adaptable location estimator for generating geographical location estimates for said mobile stations, wherein for each said [trainable] adaptable location estimator, there is a corresponding group of wireless signal measurement parameters, wherein for said adaptable location estimator to generate a location estimate of an individual one of said mobile stations, at least some of said parameters must be instantiated with values obtained from transmissions between said individual mobile station and the network, and wherein each said [trainable] adaptable location estimator [learns] adapts its generated geographical location estimates according to changes in said data collections of said archive [by associating, for each of at least some of said data item collections, said geographical location representation (a1) of the data item collection with said set of said wireless signal measurements (a2) of the data item collection];

a location estimator selector for selecting one or more of said plurality of location estimators for generating mobile station location estimates;

wherein for locating a particular one of said mobile stations, said location estimator selector selects [each of] one or more of said adaptable location estimators according to whether said at least [one] some of said parameters from said corresponding group of parameters for the [trainable] adaptable location estimator is capable of being instantiated using wireless signal measurements obtained from transmissions between said particular mobile station and the network.

110. (Amended) The location system as claimed in Claim [108] 107, wherein at least a first of said adaptable location estimators includes a first artificial neural network, and said first artificial neural network is one of: a multilayer perceptron, an adaptive resonance theory model, and radial basis function network.

111. (Amended) [The] A location system [as claimed in Claim 106,] for locating a mobile station MS using wireless signal data obtained from transmissions between the mobile station MS and a network of fixed location transceivers, wherein the transceivers are cooperatively linked for use in locating said mobile stations, comprising:

[wherein for at least one said trainable] one or more location estimators[,] for determining a location estimate of MS, wherein at least one of the [trainable] location estimators LE has[, from its corresponding group of parameters,] a parameter for receiving a value dependent upon [related to] wireless transmissions between said [particular] mobile station MS and one of said fixed location transceivers, wherein said value is indicative of at least one of the following conditions:

(a) said one transceiver is active for wireless communication with said [particular] mobile station MS and a pilot signal by said one transceiver is detected by said [particular] mobile station MS;

(b) said one transceiver is active for wireless communication with said [particular] mobile station MS and said one transceiver detects wireless transmissions by said [particular] mobile station MS;

(c) said one transceiver is active for wireless communication with said [particular] mobile station MS and said one transceiver does not detect wireless transmissions by said [particular] mobile station MS;

(d) said one transceiver is active for wireless communication with said particular mobile station and said particular mobile station does not detect wireless transmissions by said one transceiver;

(e) said one transceiver is not active for wireless communication with said particular mobile station;

an output gateway for transmitting, to a predetermined destination, a resulting location estimate that is dependent upon one or more location estimates determined by at least the location estimator LE.

113. (Amended) A location system for locating a wireless mobile station that is capable of communicating with a plurality of networked communication [base] stations, comprising:

a transceiver: (a) for at least detecting a direction of wireless signals transmitted from the mobile station, and (b) for communicating with said networked communication [base] stations information related to a location of said wireless mobile station;

a signal analyzer for determining whether a detected wireless signal from said mobile station has been one of: reflected and deflected;

one or more location estimators for providing one or more location estimates of said mobile station by using wireless signals transmitted from said mobile station, wherein at least one of said location estimators utilizes the signals from said mobile station that are determined to be neither reflected nor deflected; and

a transport [means] for moving at least said transceiver when locating said wireless mobile station.

115. (Amended) The location system as claimed in Claim 113, further including one or more location estimators for estimating a location of said transceiver, wherein at least one of said transceiver location estimators uses [measurements of] data from wireless signals communicated [transmitted from] between said transport and one of: said networked [base] communication stations and a global positioning satellite system.

116. (Amended) The location system as claimed in Claim 115, further including a deadreckoning component operatively movable with movements of said transport [transceiver] for estimating a change in a location of said transceiver, wherein said deadreckoning component determines incremental updates to at least one location estimate of said [transceiver] transport output by at least one of said transceiver location estimators.

117. (Amended) A method for locating a wireless mobile station, MS, using measurements of wireless signals, wherein at least one of: said measurements and said wireless signals are transmitted between the mobile station MS and at least one of a plurality of terrestrial transceivers, wherein said transceivers are capable of at least wireless detection of a plurality of wireless transmitting mobile stations, including said mobile station MS, comprising:

providing access to first and second mobile station location estimators, wherein each of said location estimators is capable of providing a location estimate for each mobile station of at least some of said mobile stations when said location estimator is supplied with corresponding data obtained from wireless signal measurements communicated between the mobile station and one or more of said plurality of transceivers, wherein (a) and (b) following:

(a) said first location estimator [performs one or more locating techniques, utilizing its said corresponding data, for determining] determines one or more [a locus of] first locations for the mobile station MS from at least one of the transceivers T, wherein said corresponding data [is] has values that are indicative of [a function of] a signal time delay between the mobile station MS and one or more of the transceivers, and said first location estimator determines the one or more first locations by performing a triangulation or trilateration using the values, and

(b) said second location estimator determines one or more second locations for the mobile station MS by [performs] performing at least one of (b1) through (b3) following;

(b1) an angle of arrival locating technique for estimating [a] one or more angle of arrival locations of the mobile station MS, wherein said angle of arrival locating technique determines the [a] the angle of arrival locations [estimate of the mobile station MS using] as being

along a direction from which wireless signals arrive at at least one of the transceivers from the mobile station MS;

(b2) a negative logic technique for estimating at least one area where the mobile station MS is unlikely to be located;

(b3) a signal processing technique for estimating a location of the mobile station MS using wireless signals received by the mobile station MS from a plurality of non-terrestrial transmitting stations, wherein said wireless signals provide time values, and said signal processing technique determines at least one differential between the time values for the wireless signals transmitted by two of the non-terrestrial transmitting stations;

wherein the first and second location estimators determine, respectively, the first and second locations in a manner that is substantially unaffected by the other of the first and second locations;

first supplying said first location estimator with first corresponding data obtained from received wireless signal measurements communicated between said mobile station MS and one or more of said plurality of transceivers;

second supplying said second location estimator with second corresponding data obtained from received wireless signal measurements communicated between said mobile station MS and one or more of said plurality of transceivers;

first receiving from said first location estimator, first location related information having at least the first one or more locations [a first estimate for the mobile station MS's location];

second receiving from said second location estimator, second location related information having at least the second one or more locations [a second estimate for the mobile station MS's location];

determining a resulting location estimate of the mobile station MS using at least one of: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information.

118. (Amended) A method for locating a wireless mobile station, comprising:

repeatedly performing the following steps (A1) through (A3) for tracking the mobile station, wherein there is at least a first and a second mobile station location estimator, each able to provide a location estimate of a location of the mobile station at some time during said step of repeatedly performing;

(A1) receiving a location estimate of the mobile station from at least one of a first and a second mobile station location estimators, wherein each of said location estimators is capable of providing a likely geographical location estimate for said mobile station, wherein:

(a) said first location estimator [estimates] determines a first likely geographical range for a location of the mobile station when supplied with first data, wherein said first data includes timing values obtained from wireless timing signals received by the mobile station from one or more satellites, wherein the first location estimator determines the first likely geographical range as a range between the mobile station and at least one of the one or more satellites; and

(b) said second location estimator estimates a second location of the mobile station when supplied with second data, wherein said second location estimator uses values from said second data that are obtained from time delays of wireless signals transmitted between the mobile station and [at least one transceiver of] a plurality of terrestrial transceivers cooperatively linked together for use in two way communication with the mobile station, wherein the second location estimator determines the second location determining one of: (i) a representation of a locus of locations having substantially a same time difference of arrival of wireless signals between the mobile station and at least two of the transceivers, and (ii) an area having substantially common multipath characteristics, wherein the area is identified by multipath characteristics obtained from wireless signals communicated between the mobile station and the transceivers;

[wherein each of said first and second location estimators provides at least one location estimate of the mobile station at some time during said repeated performances of said receiving step;]

(A2) determining at least one resulting location [information] of said mobile station using at least one of: (a) a first value obtained from an instance of the first location estimate received from said first location estimator, and (b) a second value obtained from an instance of the second location estimate received from said second location estimator;

wherein said step of determining includes determining the resulting [a likely] location of the mobile station by determining a likely roadway upon which the mobile station is located;

(A3) providing said resulting location information [for displaying on] to a display device, wherein said resulting location information is displayed as at least one location of the mobile station on a map having roadways thereon.

119. (Amended) A method for locating, from a plurality of wireless mobile stations, one of the wireless mobile stations using measurements of wireless signals, wherein at least one of: said measurements and said wireless signals are transmitted between said one mobile station and at least one of a plurality of fixed location communication stations, each station capable of at least one of receiving wireless signals from, and transmitting wireless signals to said one mobile station, comprising:

receiving, from each of at least first and second mobile station location estimators, corresponding first and second likely geographical ranges for a location [estimates] of said one mobile station, wherein: (a) for estimating a likely geographical range for a location, L_A, of a [some] second [one] of the mobile stations at a time T_A, said first location estimator is capable of generating a corresponding likely geographical location range without requiring a prior likely geographical location range [estimate] generated by said second location estimator for locating the second mobile station at substantially the location L_A at substantially the time T_A, and, (b) for estimating a likely geographical range for a location, L_B, of [some] a third one of the mobile stations at a time T_B, said second location estimator is capable of generating a corresponding likely geographical location without requiring a prior likely geographical location range [estimate] generated by said first location estimator for locating the third mobile station at the location L_B at substantially the time T_B;

wherein (A1) and (A2) following hold:

(A1) said first location estimator performs one or more coverage area analysis techniques when said first location estimator is supplied with first data obtained from wireless signal measurements communicated between said one mobile station and one or more of said plurality of [fixed location] the communication stations, wherein each said coverage area analysis technique determines for said one mobile station, at least one of (i) and (ii) following:

(i) an area determined using at least one of (a) and (b) following: (a) [a corresponding area] for each communication station CS of one or

more of said [fixed location] communication stations that wirelessly detect said one mobile station, a corresponding area wherein the communication station CS is likely to be able to detect said one mobile station, and (b)[or] for each communication station CS of one or more of said communication stations that is wirelessly detected by said one mobile station, a corresponding area wherein the communication station CS is likely to be detected by said one mobile station, and

(ii) an area determined using at least one of (c) and (d) following: (c) [excluded from a corresponding area] for each communication station CS of one or more of said [fixed location] communication stations that can not detect said one mobile station, a corresponding area wherein the communication station CS is unlikely to be able to detect said one mobile station, and (d)[or] for each communication station CS of one or more of said communication stations that can not be detected by said one mobile station, a corresponding area wherein the communication station CS is unlikely to be detected by said one mobile station, and

(A2) said second location estimator, when supplied with second data obtained from wireless signal measurements communicated between said one mobile station and one or more of said plurality of [fixed location] communication stations, performs at least one of the location techniques (i) through (v) following:

(i) a pattern recognition technique, wherein said pattern recognition technique estimates a location of said one [of the particular] mobile station from comparing (1) and (2) following: (1) at least one value derived from [a pattern of a plurality of time delayed signal strengths of the wireless signal measurements provided by] said second data and (2) one or more values, wherein each of the one or

more values is derived from mobile station wireless signal measurements at a known location;

(ii) a trainable mobile station location estimating technique for estimating a location of said one mobile station, wherein said trainable mobile station location estimating technique is capable of being trained to associate (1) and (2) following: (1) each location of a plurality of geographical locations, and (2) corresponding measurements of wireless signals transmitted between some one of the mobile stations and the [fixed location] communication stations, wherein said some mobile station is approximately at the location;

(iii) a locus computing technique for estimating a location of said one mobile station, wherein said locus computing technique utilizes measurements of wireless signals from said second data between said one mobile station and two or more of the [fixed location] communication stations for determining a locus of locations for said one mobile station, wherein said measurements are a function of a signal time delay between said one mobile station and at least one of the two or more [fixed location] communication stations;

(iv) an angle of arrival technique for estimating a location said one mobile station, wherein said angle of arrival technique determines a location estimate of said one mobile station using a direction from which wireless signals arrive at at least one of the [fixed location] communication stations from said one mobile station;

(v) a signal processing technique for estimating a location of said one mobile station using wireless signals received by said one mobile station from one or more non-terrestrial transmitting stations, wherein said wireless signals provide time values, and said signal processing technique determines at least one differential between the time values

for the wireless signals transmitted by two of the non-terrestrial transmitting stations;

determining a resulting location estimate of said one mobile station, wherein said step of determining includes at least one of the substeps (B1) through (B3) following:

(B1) combining both of said first and second likely geographical ranges for a location [estimates] of said one mobile station to obtain said resulting location estimate that is different from each of said first and second location estimates,

(B2) obtaining one or more values rating said first and second likely geographical ranges for a location [estimates] of said one mobile station, wherein said values are indicative of relative expected performances of said first and second location estimators in locating said one mobile station,

(B3) selecting one of said first and second likely geographical ranges for a location of said one mobile station [estimates] for receiving preference in determining said resulting location.

121. (Amended) A method for locating a wireless mobile station capable of wireless two way communication with a plurality of fixed location terrestrial stations, comprising:

providing access to a plurality of mobile station location estimators, wherein said location estimators provide location estimates of said mobile station when said location estimators are supplied with corresponding input information derived from wireless signal measurements transmitted from or received at the mobile station;

receiving, over time, a plurality of location estimates of the mobile station, wherein said step of receiving includes steps (a) and (b) following:

(a) first receiving, from a first of said location estimators, a first one or more location estimates of the mobile station, wherein said corresponding input information for said first location estimator includes timing data from wireless signals transmitted from one or more global positioning satellites, and received by the mobile station;

(b) second receiving, from a second of said location estimators, a second one or more location estimates of the mobile station, wherein said corresponding input information for said second location estimator includes data that is a function of a signal time delay of [from] wireless signals transmitted between the wireless mobile station and one of said plurality of fixed location terrestrial stations during a plurality of transmissions between the mobile station and the one terrestrial station wherein there is at least one transmission from the mobile station to the one terrestrial station, and at least one transmission from the one terrestrial station to the mobiles station[, and wherein said corresponding input information is a function of a signal time delay between the mobile station and at least one of the fixed location terrestrial stations];

determining, a plurality of consecutive resulting location estimates for tracking the mobile station, wherein said step of determining includes: (a) deriving at least one of said resulting location estimates of the mobile station using a location estimate

most recently generated from one of said first one or more location estimates by said first location estimator, and (b) deriving at least one of said resulting location estimates of the mobile station using a most recently generated one of said second one or more location estimates by said second location estimator.

126. (Amended) A method for providing a location estimate of a wireless mobile station using measurements of wireless signals, comprising:

first transmitting, when available, a first collection of measurements of wireless signals transmitted between said mobile station and one or more satellites, to a first location estimator;

second transmitting, to a second location estimator remote from the mobile station, a second collection of measurements obtained from wireless signals transmitted between said mobile station and one or more fixed location terrestrial stations, at least when said first collection is not available, wherein said second collection includes signal time delay data of wireless signals transmitted between the mobile station and the fixed location terrestrial stations;

wherein said second location estimator determines a location estimate of the mobile station dependent upon the mobile station being approximately on a locus of locations from at least one of the fixed location terrestrial stations, said locus including substantially only locations where a signal time delay dependent condition is satisfied;

first obtaining a first location estimate of said mobile station when said first location estimator is supplied with an instance of said first collection;

second obtaining a second location estimate of said mobile station when said second location estimator is supplied with an instance of said second collection;

outputting a resulting location estimate that is dependent upon at least one of said first and second location estimates.

130. (Amended) The method of Claim 126, wherein at least one of said steps of first and second transmitting includes transmitting one of said first and second collections on at least a portion of the Internet.

131. (Amended) A method for locating a mobile station using wireless signal measurements obtained from transmissions between said mobile station and a plurality of fixed location communication stations, wherein each of said communications stations includes one or more of a transmitter and a receiver for wirelessly communicating with said mobile station, comprising:

providing access to first and second mobile station location evaluators, wherein said location evaluators are able to determine information related to one or more location estimates of said mobile station when said location estimators are supplied with data having values obtained from wireless signal measurements obtained via transmissions between said mobile station and the communication stations, wherein (A) and (B) following:

(A) said first location evaluator performs one or more of the following techniques (i), (ii) and (iii) when supplied with corresponding instances of said data:

(i) a first technique for determining, for at least one of the communication stations, one of: a wireless signal angle of arrival, and a time difference of arrival between the mobile station and the at least one communication station from a two way communications therebetween, wherein the two way communication uses one of: CDMA, TDMA, GSM, NAMPS and AMPS as a communication protocol;

(ii) a second technique for estimating a location of said mobile station, using values from a corresponding instance of said data obtained from signals received at the mobile station from one or more satellites;

(iii) a third technique for [recognizing] identifying a pattern of characteristics of a corresponding instance of said data, wherein said pattern of characteristics is indicative of a plurality of wireless signal transmission paths between the mobile station and each of a plurality of antennas at one or more of the communication stations; and

(B) for the one or more of said techniques performed by said first location estimator, said second location evaluator performs a different combination of said one or more of said techniques when supplied with corresponding instances of said data for the one or more techniques of said different combination;

first obtaining, from said first location estimator, first location related information for identifying a location of the mobile station for at least one of the following situations: a tracking of the mobile station, and in response to a request for a location of the mobile station, wherein said first location estimator uses one or more available first corresponding instances of said data for said one or more techniques performed by said first location estimator;

second obtaining, from said second location evaluator, second location related information for identifying a location of the mobile station for said same at least one situation, [wherein] when said second location estimator uses one or more available second corresponding instances of said data for said different combination of said techniques;

determining a resulting location estimate of the mobile station dependent upon at least one of: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information.

133. (Amended) A method for locating a mobile station when there is an occurrence of at least one of: said mobile station being tracked, and a request for locating said mobile station, wherein said method uses wireless signal measurements obtained from transmissions between said mobile station and a plurality of fixed location communication stations, wherein each of said communications stations includes one or more of a transmitter and a receiver for wirelessly communicating with said mobile station, comprising:

providing access to first and second mobile station location evaluators, wherein said location evaluators determine information related to one or more location estimates of said mobile station when said location estimators are supplied with data having values obtained using wireless signals obtained via transmissions between said mobile station and the communication stations, wherein (A) and (B) following:

(A) said first location evaluator performs one or more of the following techniques (i), (ii) and (iii) when supplied with corresponding instances of said data:

(i) a first technique to determine a wireless signal angle of arrival between the mobile station and at least one of the communication stations;

(ii) a second technique for estimating a location of said mobile station using values from a corresponding instance of said data obtained from timing signals received at the mobile station from one or more satellites;

(iii) a third technique, wherein said third technique uses a statistical correlation for correlating (a) and (b) following:

(a) wireless signal related values of a corresponding instance of said data instance; and

(b) information indicative of a location for the mobile station,

wherein said correlation is used for determining a probability that the mobile station is within at least one geographical area, and

(B) for said one or more of said techniques performed by said first location estimator, said second location estimator performs a different combination of said one or more of said techniques when <u>said second location estimator is</u>

supplied with corresponding instances of data for the one or more techniques of said different combination;

first [generating, by] obtaining from said first location estimator, first location related information of the mobile station's location, for said [at least one] occurrence, using when available first corresponding instances of said data for each of said one or more said techniques performed by said first location estimator;

second [generating, by] obtaining from said second location estimator, second location related information of the mobile station's location, for said at least one occurrence, using when available second corresponding instances of said data for said different combination;

wherein each of said first and second location related information is capable of being generated independently of the other of said first and second location related information;

determining a resulting location estimate of the mobile station using at least one of (a) and (b) following: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information;

wherein said step of determining includes a step of identifying one or more subareas for said resulting location, said one or more subareas selected from a predetermined plurality of subareas of a larger mapped area.

134. (Amended) A method for locating a mobile station using wireless signal measurements obtained from transmissions between said mobile station and a plurality of [fixed location] communication stations, wherein each of said communications stations includes one or more of a transmitter and a receiver for wirelessly communicating with said mobile station, comprising:

receiving a request for a location of the mobile station;

generating one or more requests for information related to a location of said mobile station from one or more mobile station location evaluators such that when said location estimators are supplied with data having values obtained from wireless signal measurements obtained via transmissions between said mobile station and the communication stations, said one or more location evaluators perform at least two of the following techniques (i), (ii), (iii) and (iv) when said techniques are supplied with a corresponding portion of said data:

(i) a first technique for determining at least one location area or locus for said mobile station using timing measurements indicative of one of: a time of arrival of wireless signals, and a time difference of arrival of wireless signals between the mobile station and at least one communication station CS, wherein the signals for obtaining the timing measurements are communicated during a plurality of wireless signal transmissions between the mobile station and CS, with at least one of the transmissions being from the mobile station to CS;

(ii) a second technique for determining, for at least some one of the communication stations, a wireless signal angle of arrival that is indicative of an angular orientation about at least one communication station CS of a direction of the wireless signal to CS from [between] the mobile station [and the at least some one communication station];

(iii) a third technique for estimating a location of said mobile station, using timing values from a corresponding portion of said data obtained from signals received at the mobile station from one or more satellites;

(iv) a fourth technique, wherein said fourth technique provides a pattern recognizer for estimating a location of said mobile station by deriving said location estimate from a pattern of multipath wireless signal characteristics between: (a) one or more of the communication stations, and (b) said mobile station;

first obtaining, from said one or more location estimators, a first one or more location estimates using an available first one or more corresponding portions of said data;

determining a resulting location estimate of the mobile station obtained from at least one of said first one or more location estimates;

wherein at least one of said steps of receiving, generating, first obtaining, and determining include a substep of one of: (i) transmitting information to a predetermined destination using one of a public switched network and the Internet, and (ii) receiving information from a predetermined source using one of a public switched network and the Internet.

137. (Amended) A method for locating a mobile station when there is [an] at least one occurrence of [at least one of]: said mobile station being tracked, and a request for locating said mobile station, wherein said method uses wireless signal measurements obtained from transmissions between said mobile station and a plurality of fixed location communication stations, wherein each of said communications stations includes one or more of a transmitter and a receiver for wirelessly communicating with said mobile station, comprising:

providing first and second mobile station location evaluators, wherein said location evaluators determine information related to one or more location estimates of said mobile station when said location estimators are supplied with data having values obtained from wireless signal measurements obtained via transmissions between said mobile station and the communication stations, wherein (A) and (B) following:

(A) said first location evaluator performs one or more of the following techniques (i), (ii), (iii) and (iv) when said techniques are supplied with a corresponding instance of said data:

(i) a first technique for determining from a two way communication between the mobile station and at least one of the communication stations CS, [for at least one of the communication stations], one of: a wireless signal angle of arrival , and a time difference of arrival between the mobile station and the at least one communication station;

(ii) a second technique for estimating a location of said mobile station, using timing values from a corresponding instance of said data obtained from signals received at the mobile station from one or more satellites;

(iii) a third technique[, wherein said third technique provides an association for associating, for each of a plurality of mobile station locations, multipath wireless signal characteristics between: (a) one or more of the communication stations, and (b) a mobile station at the

location] for recognizing multipath characteristics from a corresponding instance of said data, wherein said third technique includes the steps of (a) and (b) following:

(a) calibrating, for each of a plurality geographical locations, (a1) and (a2) following: (a1) a representation of the geographical location, and (a2) for the geographical location, corresponding multipath information indicative of multipath signals previously transmitted between some mobile station and the communication stations, when the some mobile station transmitted from approximately the geographical location;

(b) determining one or more likely location estimates for the mobile station from a similarity between (b1) and (b2) following: (b1) multipath characteristics determined from wireless signals communicated between the mobile station and the communication stations, and (b2) the multipath information of (a2) for a collection of one or more of the geographical locations; and

(iv) a fourth technique, wherein said fourth technique uses a statistical correlation for correlating (a) and (b) following:

(a) wireless signal related values obtained from a corresponding instance of said data, and

(b) information indicative of a location for the mobile station, wherein said correlation is used for determining a value indicative of a likelihood that the mobile station is within a corresponding geographical area, and

(B) for said one or more of said techniques performed by said first location estimator, said second location evaluator performs a different combination of said one or more of said techniques when supplied with corresponding instances of said data for the one or more techniques of said different combination of techniques;

first obtaining, from said first location estimator, first location related information, for said at least one occurrence, using a supplied first one or more corresponding instances of said data for at least a time when said first one or more corresponding instances are available;

second obtaining, from said second location evaluator, second location related information, for said at least one occurrence, using a supplied second one or more corresponding instances of said data for at least a time when said second one or more corresponding instances are available;

wherein each of said first and second location related information is capable of being obtained substantially independently from the obtaining of the other of said first and second location related information;

determining a resulting location estimate of the mobile station dependent upon at least one of: (a) a first value obtained from said first location related information, and (b) a second value obtained from said second location related information.

138. (Amended) The method of Claim 137, wherein one or more of:

(a) said first technique includes a step of performing one of a triangulation and a trilateration;

(b) said third technique includes a step of activating an artificial neural network;

(c) [a procedure] said fourth technique includes <u>a step of</u> performing one of: a principle decomposition , a least squares, a partial least squares, and a procedure using Bollenger Bands.

139. (Amended) A method for locating a wireless mobile station using wireless signal measurements obtained from transmissions between said mobile station and a plurality of communication stations capable of wirelessly detecting said mobile station, comprising:

first determining whether a first location estimate of said mobile station is capable of being determined using a first collection [combination] of one or more of (a) through (c) following:

(a) a first technique for determining, for at least one of the communication stations CS, a wireless signal angle of arrival at the at least one communication station CS, and a time difference of arrival between the mobile station and the at least one communication station CS using the wireless signal timing measurements, wherein the signals for obtaining the timing measurements are communicated during a plurality of wireless signal transmissions between the mobile station and CS, with at least one of the transmissions being from the mobile station to CS;

(b) a second technique using measurements from signals received at the mobile station from one or more satellites;

(c) a pattern recognition location technique for estimating a location of said mobile station by recognizing a pattern of characteristics of data obtained from wireless signal measurements, wherein said pattern of characteristics is indicative of multipath wireless signal transmissions paths between the mobile station and one or more of the communication stations;

[(d) an angle of arrival technique, wherein an angle of arrival of signal transmissions from said mobile station is determined at one or more of the communication stations;]

second determining a second location estimate of said mobile station by a different collection [combination] of one or more of said techniques when one of: (i)

said step of first determining determines that said first collection [combination] is unable to provide said first location estimate, and (ii) said second location estimate is expected to be more accurate or reliable than said first location estimate.

140. (Amended) A method for locating a mobile station using wireless signal measurements obtained from transmissions between said mobile station and at least one of a plurality of terrestrial transceivers [communication stations] capable of wirelessly detecting said mobile station, comprising:

providing access to one or more of the location techniques (a) through (c) following:

(a) a first technique for triangulating, wherein for each of three or more of the communication stations, one of: a signal time of arrival, and a signal time difference of arrival between the mobile station and one of the transceivers [communication station] is determined using a first input obtained from the wireless signal measurements, wherein the signals for obtaining the wireless signal measurements are communicated during a plurality of wireless signal transmissions between the mobile station and the one transceiver, with at least one of the transmissions being from the mobile station to the one transceiver, and at least one of the transmissions being from the one transceiver to the mobile station;

(b) a second technique using a second input obtained from one or more transmissions between the mobile station and the transceivers [communication stations], said second input including time delay measurements of signals received at the mobile station from one or more satellites;

(c) a third technique that [learns] determines a location of the mobile station by using [an association between] a plurality of pairs of (i) and (ii) following:

(i) characteristics of wireless multipath signals communicated between some mobile station and one or more of the transceivers [communication stations], and

(ii) a location of said some mobile station during the communication,

wherein [said association is determined by a training process using a plurality of said pairs, wherein] when said third technique is supplied with a third input of characteristics of wireless multipath signals communicated between said mobile station and one or more of the transceivers [communication stations], data indicative of a location of the mobile station is obtained from a similarity between the third input and the characteristics of wireless multipath signals of (c)(i);

determining whether a particular one of the location techniques (a) through (c) has its corresponding input available ~~for~~ determining a first location estimate of said mobile station;

determining a second location estimate of said mobile station by activating one of said location techniques different from said particular location technique when the corresponding input for said different technique is available.

142. (Amended) A method for locating a mobile station using wireless signal measurements obtained from transmissions between the mobile station and at least one of a plurality of communication stations, wherein each of said communications stations includes one or more of a transmitter and a receiver for wirelessly communicating with the mobile station wirelessly, comprising:

providing access to at least first and second location estimators for estimating a location of the mobile station, wherein for said first location estimator to estimate a location of the mobile station, said first estimator is dependent upon a result from a first location technique included in one of the following (a) through (e) location technique categories, and for said second location estimator to estimate a location of the mobile station, said second estimator is dependent upon a result from a second component included in a different one of the following (a) through (e) location technique categories:

(a) one of a trilateration and a triangulation technique for determining, for each of three or more of the communication stations, one of: a wireless signal time of arrival, and a wireless signal time difference of arrival between the mobile station and the communication station using a first input obtained from timing measurements of the wireless signal measurements, wherein for at least one of three or more communication stations CS the timing measurements are obtained from signals communicated during a plurality of wireless signal transmissions between the mobile station and CS, with at least one of the transmissions being from the mobile station to CS;

(b) a stochastic technique, wherein said stochastic technique uses a statistical correlation for correlating:

(i) a second input obtained from the wireless signal measurements, and

(ii) data indicative of a location area for the mobile station,

wherein a probability that the mobile station is within the correlated location area is determined from said correlation;

(c) a learning technique, for learning an association, wherein said association is determined by a training process using a plurality of data pairs, each said pair including: first information indicative of a location of some mobile station, and second information from wireless signal measurements between said some mobile station and one or more of the communication stations when said some mobile station is at the location,

wherein when said learning technique is supplied with a third input obtained from the wireless signal measurements obtained from transmissions between the mobile station and at least one of a plurality of communication stations, data indicative of a location for the mobile station is determined;

(d)a pattern recognition location technique for estimating a location of the mobile station by recognizing a pattern of characteristics of a fourth input obtained from the wireless signal measurements, wherein said pattern of characteristics is indicative of multipath wireless signal transmissions between the mobile station and one or more of the communication stations;

(e) a location technique using a fifth input obtained from measurements from signals received at the mobile station from one or more satellites;

determining whether said first location estimator has its corresponding input available for determining a first location estimate of the mobile station;

determining a second location estimate of said mobile station by activating said second location estimator when the corresponding input for said second location estimator is available, and said corresponding input to said first location estimator is unavailable.

152. (Amended) A location system for locating one or more wireless mobile stations using wireless signal measurements obtained from transmissions between said mobile stations and a plurality of communication stations capable of at least one of: wirelessly detecting said mobile stations, and being wirelessly detected by said mobile stations, comprising:

an archive for storing a plurality of data item collections, wherein each said data item collection includes (a1) and (a2) following:

(a1)a representation of a location of one of said mobile stations,

(a2)data indicative of said wireless signal transmissions between said one mobile station and at least one of said communication stations, wherein said one mobile station transmits from approximately the mobile station location;

a plurality of location estimators, each of at least some of said location estimators accesses information indicative of at least one correspondence[association] between (a1) and (a2) for a plurality of said data item collections for determining a location estimate of an unknown location of a particular one of said mobile stations, wherein said location estimator uses a corresponding data set indicative of wireless signal transmissions between said particular mobile station at said unknown location, and one or more of said communication stations;

a location estimator selector for selecting one or more of said plurality of location estimators for determining one or more location estimates of said particular mobile station, said selector selects each said location estimator by using information indicative of identifications of one or more communication devices, wherein each said communication device: (i) is one of a wireless signal transmitter and a wireless signal receiver located at one of said communication stations, and (ii) communicates with said particular mobile station thereby providing at least a portion of said corresponding data set used by said location estimator.

159. (Amended) A method for locating a mobile station using wireless signal data obtained from transmissions between said mobile station and a plurality of communication stations capable of at least one of: wirelessly detecting said mobile station, and wirelessly being detected by said mobile station, wherein said communication stations are able to provide voice communication with the mobile station, comprising:

receiving said wireless signal data obtained from transmissions between said communication stations and said mobile station at an unknown location, wherein said wireless signal data includes at least two of (A1) through (A3) following:

(A1) signal timing measurements of wireless signal transmissions between said mobile station and one or more of said communication stations at terrestrial locations, wherein for at least one of the communication stations CS, there is a corresponding portion of the signal timing measurements that are obtained during a plurality of wireless signal transmissions between the mobile station and CS, with at least one of the transmissions being from the mobile station to CS;

(A2) time delay measurements from wireless signal transmissions from one or more satellites to said mobile station, each of the satellites having one of the communication stations;

(A3) signal pattern characteristics of wireless signal transmissions between said mobile station and one or more of said communication stations, wherein said signal pattern characteristics are indicative of a multipath signal pattern at the unknown location between the mobile station and at least one of the communication stations;

generating one or more location estimates of said mobile station, using said wireless signal data, and at least two of the following location techniques (B1) through (B3) [(B4)] following:

(B1) a triangulation or trilateration technique using the measurements from (A1);

(B2) a triangulation technique using the measurements from (A2);

(B3) a pattern recognition technique for estimating a location of said mobile station by recognizing a signal pattern of characteristics from (A3).

160. (Amended) The method as claimed in Claim 159, wherein said step of generating includes performing a stochastic technique for generating a location estimate of said mobile station, wherein said stochastic technique uses a statistical correlation for correlating:

(i) measurements from said wireless signal data, and

(ii) previously obtained wireless signal data indicative of a plurality of known mobile station locations;

wherein said stochastic technique determines a probability that said unknown location is within a geographic area [associated with the probability].

163. (Amended) A mobile station location system, comprising:

an interface to one or more mobile station location estimators for estimating locations of mobile stations, such that for each of at least some of the mobile stations, when said one or more location estimators are [each] supplied with corresponding data obtained from measurements of wireless signals transmitted between the mobile station, and at least one of (1) and (2) following:

(1) a plurality of communication stations capable of at least one of: wirelessly detecting said mobile stations, and being wirelessly detected by said mobile stations, and

(2) one or more non-terrestrial wireless signal transmitting stations,

then for said one or more location estimators supplied with their corresponding data, each such estimator outputs a corresponding location estimate[s] of a geographical location of the mobile station;

wherein for a first of said mobile station location estimators, when estimating a location of one of the mobile stations, said first estimator is dependent upon a result from a first component included in one of the following (a) through (f) component categories, and for a second of said mobile station location estimators, when estimating a location of one of the mobile stations, said second estimator is dependent upon a result from a second component included in a different one of the following (a) through (f) component categories, wherein for at least one instance of locating one of the mobile stations, said first and second estimators provide different location estimates:

(a) a category of pattern recognition components, wherein each said pattern recognition component estimates a location of one of the mobile stations from a pattern of multipath signal characteristics including a plurality of time delayed signal strengths of the wireless signal measurements provided by said corresponding data for said pattern recognition component;

(b) a category of trainable mobile station location estimating components for estimating a location of the mobile station, wherein each said trainable mobile station location estimating component is capable of being trained to

associate: (i) each location of a plurality of geographical locations with (ii) corresponding measurements of wireless signals transmitted between some one of said mobile stations and the plurality of communication stations, wherein said some mobile station is approximately at the location;

(c) a category of locus computing components for estimating a location of the mobile station, wherein said locus computing components utilize timing measurements of wireless signals from their said corresponding data between the mobile station and two or more of the communication stations for determining a locus of locations for the mobile station, wherein said measurements are a function of a signal time delay between the mobile station and at least one communication station CS of the two or more communication stations, said [at least one of the two or more] communication station[s] CS being attached to the ground, and wherein there is a corresponding portion of the signal timing measurements that are obtained during a plurality of wireless signal transmissions between the mobile station and CS, with at least one of the transmissions being from the mobile station to CS;

(d) a category of angle of arrival components for estimating a location of the mobile station, wherein each of said angle of arrival components determine a location estimate of the mobile station using a direction from which wireless signals arrive at at least one of the communication stations from the mobile station;

(e) a category of negative logic components for estimating an area of where the mobile station is unlikely to be located;

(f) a category of signal processing components for estimating a location of the mobile station using wireless signals received at the mobile station from the non-terrestrial transmitting stations, wherein said wireless signals provide time values, and said signal processing components determine at least one differential between the time values for the wireless signals transmitted by two of the non-terrestrial transmitting stations;

wherein said interface includes a component for communicating on a communications network with at least one of said one or more location estimators and thereby receiving, from said at least one estimator, said corresponding location estimate of the mobile station; and

a resulting estimator for determining a likely location estimate of a particular mobile station, said resulting estimator receiving one or more of said corresponding location estimates for the particular mobile station from said interface, said resulting estimator having at least one of: (i) a selector for identifying at least one preferred location estimate from said corresponding location estimates, said likely location estimate being at least as dependent on said preferred location estimate as any other of said one or more corresponding location estimates, and (ii) a combiner for combining said one or more corresponding location estimates for obtaining said likely location estimate.

169. (Amended) A mobile station location system, comprising:

an interface to a plurality of mobile station location estimators for estimating locations of mobile stations, such that for each of at least some of the mobile stations, when one or more of said location estimators are supplied with corresponding data obtained from measurements of wireless signals transmitted between:

(i) the mobile station, and

(ii) at least one of: a network of communication stations cooperatively linked for use in locating the mobile stations, and one or more non-terrestrial wireless signal transmitting stations,

then for said one or more location estimators supplied with their corresponding data, each such estimator outputs a corresponding location estimate[s] of a geographical location of the mobile station;

wherein for a first of said mobile station location estimators, when estimating a location of one of the mobile stations, said first estimator is dependent upon a result from a first component included in one of the following (a) through (c) component categories, and for a second of said mobile station location estimators, when estimating a location of one of the mobile stations, said second estimator is dependent upon a result from a second component included in a different one of the following (a) through (c) component categories, wherein for at least one instance of locating one of the mobile stations, said first and second estimators provide different location estimates:

(a) a category of pattern recognition components for estimating a location of the mobile station from a pattern of wireless signal characteristics including a plurality of time delayed signal strengths of the wireless signal measurements provided by said corresponding data;

(b) a category of triangulation components for estimating a location of the mobile station, wherein said triangulation components utilize timing measurements of wireless signals from their said corresponding data between the mobile station and three of the communication stations for determining a location estimate of the mobile station, wherein said

measurements are a function of a signal time delay between the mobile station and at least one communication station CS of the three communication stations, said [at least one of the three] communication station[s] CS being attached to the ground, and wherein there is a corresponding portion of the signal timing measurements that are obtained during a plurality of wireless signal transmissions between the mobile station and CS, with at least one of the transmissions being from the mobile station to CS;

(c) a category of signal processing components for estimating a location of the mobile station using wireless signals received at the mobile station from the non-terrestrial transmitting stations, wherein said wireless signals provide time values, and said signal processing components determine at least one differential between the time values for the wireless signals transmitted by two of the non-terrestrial transmitting stations;

wherein said interface includes a component for communicating on a predetermined communications network for communicating with at least one of said first and second estimators and thereby receiving, from said at least one estimator, said corresponding location estimate of the mobile station; and

a resulting estimator for determining a likely location estimate of a particular mobile station, said resulting estimator receives one or more of said corresponding location estimates for the particular mobile station from said interface, said resulting estimator having at least one of: (i) a selector for selecting at least one preferred location estimate from said corresponding location estimates, said likely location estimate being at least as dependent on said preferred location estimate as any other of said corresponding location estimates, and (ii) a combiner for combining said corresponding location estimates for obtaining said likely location estimate.

174. (Amended) A method for locating a mobile station, comprising:

providing access to a plurality of mobile station location estimators for estimating locations of mobile stations, such that for each of at least some of the mobile stations, when one or more of said location estimators are supplied with corresponding data obtained from measurements of wireless signals transmitted between:

(i) the mobile station, and

(ii) at least one of: (1) a network of communication stations cooperatively linked for use in locating the mobile stations, and (2) one or more non-terrestrial wireless signal transmitting stations, ,

then said one or more location estimators each output corresponding location estimates of a geographical location of the mobile station;

receiving a request for locating a particular one of the mobile stations;

first obtaining, from a first of said mobile station location estimators, a first location estimate of the particular mobile station when said corresponding data for said first estimator is input to said first estimator, said first estimator being dependent upon a result from a first component included in one of the component categories (a) through (e) following the step of second obtaining;

second obtaining from a second of said mobile station location estimators, a second location estimate of the particular mobile station when said corresponding data for said second estimator is input to said second estimator, said second estimator being dependent upon a result from a second component included in a component category (a) through (e) following different from said component category having said first component, wherein for at least one instance of locating one of the mobile stations, said first and second estimators provide different location estimates:

(a) a category of pattern recognition components, wherein each said pattern recognition component estimates a location of one of the mobile stations from a pattern of multipath signal characteristics including a plurality of time delayed signal strengths of the wireless signal measurements provided by said corresponding data for said pattern recognition component;

(b)a category of trainable mobile station location estimating components for estimating a location of the mobile station, wherein each said trainable mobile station location estimating component is capable of being trained to associate: (i) each location of a plurality of geographical locations with (ii) corresponding measurements of wireless signals transmitted between some one of said mobile stations and the network of communication stations, wherein said some mobile station is approximately at the location;

(c)a category of triangulation components for estimating a location of the mobile station, wherein said triangulation components utilize timing measurements of wireless signals from their said corresponding data between the mobile station and three of the communication stations for determining a location estimate of the mobile station, wherein said measurements are a function of a signal time delay between the particular mobile station and at least one communication station CS of the three communication stations, said [at least one of the three] communication station[s] CS being attached to the ground, and wherein there is a corresponding portion of the signal timing measurements that are obtained during a plurality of wireless signal transmissions between the mobile station and CS, with at least one of the transmissions being from the mobile station to CS;

(d)a category of angle of arrival components for estimating a location of said particular mobile station, wherein each of said angle of arrival components determine a location estimate of the mobile station using a direction from which wireless signals arrive at at least one of the communication stations from the mobile station;

(e)a category of signal processing components for estimating a location of the mobile station using wireless signals received at the mobile station from the non-terrestrial transmitting stations, wherein said wireless signals provide time values, and said signal processing

components determine at least one differential between the time values for the wireless signals transmitted by two of the non-terrestrial transmitting stations;

generating a resulting location estimate of the particular mobile station, said resulting location estimate being dependent upon an estimate of the particular mobile station from at least one of said first and second mobile station location estimators when said corresponding data for said at least one of the first and second estimators is input to said at least one of the first and second estimators;

wherein said step of generating includes at least one of the substeps (i) and (ii) following: (i) identifying at least one preferred location estimate from said first and second location estimates, said resulting location estimate being at least as dependent on said preferred location estimate as any other of said corresponding location estimates obtained, and (ii) combining said first and second location estimates for obtaining said resulting location estimate.

179. (Amended) A method for locating a wireless mobile station, comprising:

repeatedly performing the following steps (A1) through (A3) for tracking the mobile station;

(A1) receiving a location estimate of the mobile station said location estimate obtained from using at least one of (a) and (b) following:

(a) first data obtained from wireless timing signals received by the mobile station from one or more satellites, wherein said timing signals from each of the one or more satellites identify a locus of locations of the mobile station; and

(b) second data obtained from time delays of wireless signals transmitted between the mobile station and one or more transceivers of a plurality of transceivers cooperatively linked together for use in locating the mobile station, wherein said time delays identify a locus of locations of the mobile from at least one of the transceivers, and wherein for one of the one or more transceivers, the time delays are obtained from signals transmitted during a plurality of wireless signal transmissions between the mobile station and the one transceiver, with at least one of the transmissions being from the mobile station to the one transceiver;

wherein an instance of each of (a) and (b) are used at some time during the tracking of the mobile station for determining a respective location during the tracking of the mobile station;

(A2) determining a likely location of the mobile station by determining a likely roadway upon which the mobile station is located;

(A3) providing information indicative of said likely location information for displaying on a display device a representation of a location of the mobile station with a map having roadways thereon.

Please enter the following new claims:

180.(New) The method of Claim 85, wherein for at least said mobile station MS_0, said manner by which said first and second estimators determine said first and second likely geographical ranges is such that said first and second likely geographical ranges are determined independently of one another.

181. (New) A location system for locating a mobile station MS using wireless signal measurements obtained from transmissions between said mobile station MS and a network of location transceivers, wherein said transceivers are cooperatively linked for use in locating the mobile stations, the improvement characterized by:

a communications interface for routing to each of one or more location estimators corresponding input data for estimating one or more initial locations of said mobile station MS, wherein said corresponding input data is obtained using measurements of wireless signals obtained from transmissions between (i) and (ii) following:

(i) the mobile station MS, at a corresponding geographical location, and

(ii) the network of transceivers;

a location estimate adjuster for deriving an additional location estimate of said mobile station MS using a first initial location estimate generated by a first of said location estimators, wherein said additional location estimate is determined using other location estimates generated by said first location estimator previously to the generation of said first initial location estimate, wherein said additional location estimate is determined using known locations corresponding to said other location estimates; and

an output gateway for transmitting, to a predetermined destination, a resulting location estimate that is dependent upon one or more of said first initial location estimate and said additional location estimate.

182. (New) The method of Claim 85, wherein said at least one communication station transmits a first wireless signal to the MS and receives in response to said first wireless signal, a responsive signal from the MS, and any intermediary devices for transmitting signals between said MS and the communication stations are terrestrial.

183. (New) The method of Claim 182, wherein said plurality of communication stations includes at least some communication stations that are able to provide voice communication between the mobile station MS and another party, wherein the communication travels through a public switched telephone network, and the mobile station is hand-held.

184 (New) The method of Claim 183, wherein said communication between the mobile station MS and the another party uses one of the following wireless transmission techniques: CDMA, TDMA, GSM, AMPS, and NAMPS.

185. (New) The method of Claim 85, further including providing a wireless transmission to a second mobile station, wherein said second mobile is capable of moving toward the mobile station MS.

186. (New) The method of Claim 85, wherein said angulation technique determines both said distance between a first instance of the at least one communication station and the MS, and said wireless signal angle-of-arrival between the MS and a second instance of the at least one communication station.

187. (New) The method of Claim 97, wherein said one or more location evaluators perform at least three of the following techniques (i), (ii) and (iii).

188. (New) The method of Claim 97, wherein said mobile station MS is included a mobile telephone that communicates with at least some of said communication stations using one of the following wireless transmission techniques: CDMA, TDMA, GSM, AMPS, and NAMPS.

189. (New) The method of Claim 97, wherein said step of transmitting includes transmitting said resulting information on the Internet.

190. (New) The method of Claim 99 further including a step of receiving said input data from a commercial mobile radio service provider (CMRS), and the at least one communication station CS is one of included in and co-located with a base station of said CMRS that is in two way communication with the mobile station.

191. (New) The method of Claim 99, wherein said third technique uses a time difference of arrival of wireless signals transmitted between the mobile station MS3

and the communication station CS for determining a locus of points having a hyperbolic shape.

192. (New) The method of Claim 99, wherein the communication station CS transmits a first wireless signal to the MS3 and receives in response to said first wireless signal, a responsive signal from the MS3, and any intermediary devices for transmitting signals between the MS3 and the communication stations are terrestrial.

193. (New) The method of Claim 99, wherein said step of first transmitting includes responding to an Internet request to locate the first mobile station.

194. (New) The method of Claim 193, wherein the first mobile station is a moving vehicle.

195. (New) The method of Claim 97, wherein said third technique includes performing one of: a least squares process, partial least squares process, and a principle decomposition process.

196. (New) The method of Claim 85, further including a step of requesting the mobile station MS to raise its transmission power level.

197. (New) The location system of Claim 100, wherein said location determiner includes a snap to route module, wherein said resulting location information of said mobile station MS identifies a vehicle route near an intermediate location determined using said likely geographical location LE.

198. (New) The method of Claim 100 further including a step of transmitting said resulting location estimate via one of the Internet and a public switched telephone network.

199. (New) The method of Claim 85 further including a step of transmitting said resulting location estimate via one of the Internet and a public switched telephone network.

200. (New) The method of Claim 97, wherein said transmitting includes transmitting said resulting information via one of the Internet and a public switched telephone network.

201. (New) The method of Claim 101 further including a step of transmitting said further location estimate via one of the Internet and a public switched telephone network.

202. (New) The method of Claim 106, wherein at least one of said adaptable location estimators adapts by one of:

associating, for each of at least some of said data collections, said geographical location representation (a1) of the data collection with said set of said wireless signal measurements (a2) of the data collection; and

determining a statistical similarity between (b1) and (b2) following: (b1) wireless signal measurements obtained from transmissions between said particular mobile station and the network, and (b2) said wireless signal measurements (a2) of the data collections in said archive.

203. (New) A method for locating a mobile station MS, of a plurality of mobile stations, using wireless signal data obtained from transmissions between said mobile station MS and a plurality of fixed location receivers, wherein each said receiver is capable of at least wirelessly detecting said mobile stations, comprising :

providing a plurality of data instances, wherein for each of a plurality geographical locations, there is one of said data instances having (a1) and (a2) following:

(a1) a representation of the geographical location,

(a2) corresponding multipath related information of wireless signal data obtained using transmissions between one of said mobile stations and said receivers, wherein the one mobile station transmits from approximately the geographical location of (a1);

providing a plurality of location estimators for locating the mobile stations, wherein for a set, C, having at least some of the location estimators, (b1) – (b3) following hold:

(b1) for each said location estimator of C, there is a predetermined corresponding collection of receivers from which the location estimator receives a corresponding input of wireless signal multipath

data obtained from one of said mobile stations whose location is to be determined by the location estimator;

(b2) for determining locations of said mobile stations, each said location estimator of C is dependent upon (i) and (ii) following: (i) (a1) and (a2) of at least some of said data instances, and (ii) multipath information from wireless signals communicated between the mobile stations and said predetermined corresponding collection of receivers;

(b3) for at least two of said location estimators of C, their predetermined corresponding collections of receivers are different;

determining, using each of one or more of said location estimators of C, one or more location estimates of the mobile station MS when an occurrence of said wireless signal multipath data is obtained from wireless signals received from the mobile station MS by the corresponding collection of receivers;

transmitting, to a predetermined destination, via a communications network, resulting information related to the location of the mobile station MS, wherein said resulting information is obtained from said one or more of said location estimates.

204. (New) The method of Claim 203, wherein when determining locations of the mobile stations, each of the location estimators of C change their location estimates when there are changes to the plurality of data instances.

205. (New) The method of Claim 203, wherein at least some of the receivers are co-located, wherein there is a plurality of sites each having a plurality of the receivers co-located therewith.

206. (New) The method of Claim 203, wherein said step of providing includes calibrating, for each of the plurality geographical locations, (a1) with (a2) using wireless signal transmissions from having a GPS receiver therein.

207. (New) The method of Claim 203, wherein at least one of the location estimators performs the following step:

determining one or more likely location estimates for MS by identifying a similarity between (i) and (ii) following: (i) multipath characteristics determined from wireless signals communicated between the mobile station MS and the transceivers,

and (ii) the multipath information of (a2) for a collection of one or more of the geographical locations.

208. (New) The method of Claim 203, wherein at least one of the location estimators performs the following step:

statistically correlating (c1) and (c2) following:

(c1) values that are a function of at least one of: a signal strength and a signal time delay of wireless signals between said mobile station MS and the transceivers, and

(c2) values that are a function of at least one of signal strength and a signal time delay of wireless signals provided by (a2) for at least some of the data instances;

wherein an output from the correlating step is dependent upon the representations (a1) of the at least some of the data instances.

209 (New) The method of Claim 208, wherein the step of statistically correlating includes performing one of a statistical regression between (a2) for at least some of the data instances, and multipath information from wireless signals received for the mobile station MS.

210. (New) The method of Claim 203, wherein at least some of said receivers are substantially co-located with base stations of a commercial mobile radio service provider (CMRS), wherein each of said base stations support two way voice communication with the mobile stations via a plurality antennas at said base station, and the two way voice communication is provided by one of the following wireless transmission techniques: CDMA, TDMA, GSM, AMPS, and NAMPS.

211. (New) The method of Claim 210, wherein at least some of said receivers are included within transceivers at said base stations, wherein said transceivers support the two way voice communication with the mobile stations.

212. (New) The method of Claim 210, wherein said one or more location estimates are for substantially a same location of the mobile station MS, and further including a step of resolving location ambiguities between said location estimates.

213. (New) The method of Claim 212, wherein said step of resolving includes determining for each of one or more of said location estimates, one or more of:

(a) a corresponding likelihood value that said mobile station MS is within the location estimate;

(b) a condition related to a corresponding velocity or change of velocity of the mobile station MS coinciding with the location estimate;

(c) a condition related to a corresponding terrain of the location estimate; and

(d) a consistency with a previous instance of locating the mobile station MS.

214. (New) The method of Claim 212, wherein said step of resolving includes performing a most likely location estimation procedure using said location estimates for thereby determining a most likely location of the mobile station MS.

215. (New) The method of Claim 214, wherein for at least some of the location estimators of C, their predetermined corresponding collections of receivers are different from one another, and the mobile station MS is terrestrial.

216. (New) The method of Claim 212, wherein one or more of said location estimators includes a statistical prediction technique.

217. (New) The method of Claim 212, wherein said step of resolving includes detecting a clustering of at least some of said one or more location estimates for determining a most likely location of the mobile station MS.

218. (New) The method of Claim 212, wherein for each of said location estimators of C, said predetermined corresponding collection receivers has at least one of said receivers that is different from said predetermined corresponding collection of receivers for a different one of said location estimators.

219. (New) The method of Claim 203, wherein said step of determining includes obtaining a location estimate of the mobile station MS from less than all of said location estimators.

220. (New) The method of Claim 219, wherein for each of at least some of said location estimators, the corresponding collection of receivers detects wireless multipath signals from a geographical area different from the predetermined

corresponding collection of receivers for said at least some of said location estimators.

221, (New) The method of Claim 220, wherein at least one of said one or more location estimators uses input indicative of additional of said receivers detecting the mobile station MS.

222. (New) The method of Claim 203, wherein at least some of said receivers are included in a base station network of a commercial mobile radio service provider, wherein there is a further step of the commercial mobile radio service provider outputting a request for the mobile station MS to raise its transmission power.

223. (New) The method of Claim 203, further including a step of calibrating at least one of said location estimators using said plurality of data instances.

224. (New) The method of Claim 203 said step of transmitting includes outputting said resulting information using one of a public switched network and the Internet.

225. (New) The method of Claim 224, further including a step of obtaining said resulting information from said one or more of said location estimates, wherein said step of obtaining includes one or more of:

(c1) snapping a location of the mobile station MS to a vehicle traffic route;

(c2) detecting a clustering of said one or more location estimates for determining a most likely location of the mobile station MS; and

(c3) using, for each of said one or more location estimates, a corresponding likelihood value for determining said resulting information.

226. (New) A method for locating a mobile station MS, of a plurality of mobile stations, using wireless signal data obtained from transmissions between said mobile station MS and a plurality of land borne wireless receivers, wherein each said receiver is capable of at least wirelessly detecting said mobile stations, comprising:

obtaining data indicative of wireless signal multipath at a plurality of known locations;

deriving, for each of at least some of the plurality of known locations, corresponding multipath information indicative of the wireless signal multipath at the known location;

storing, for each location L of the known locations, an instance of (a1) and (a2) following:

(a1) a representation of L, and

(a2) said corresponding multipath information, wherein said corresponding multipath information is indicative of the wireless signal multipath at the location L;

activating one or more of a plurality of location estimators for determining one or more of location estimates of the mobile station MS, wherein (b1) – (b3) following:

(b1) for each said location estimator, there is a corresponding collection of receivers from which the location estimator receives a corresponding input of wireless signal multipath data when a location estimate of the mobile station MS is determined by the location estimator;

(b2) each of the location estimators performs a step of determining one or more likely location estimates for MS by identifying a similarity between (i) and (ii) following: (i) multipath characteristics determined from wireless signals communicated between the mobile station MS and the corresponding collection of receivers, and (ii) the multipath information of (a2) for a collection of one or more of the locations;

(b3) for each of said location estimators, the corresponding collection of receivers is different from the corresponding collection of receivers for a different one of said location estimators;

determining, from said one or more location estimates, a most likely location of the mobile station MS;

outputting, to a predetermined destination, via a communications network, resulting information related to the location of the mobile station MS, wherein said resulting information is obtained from said one or more of said location estimates.

227. (New) The method of Claim 226 further including, for each of at least some of said one or more activated location estimators, the step of determining one or more likely location estimates identifies the similarity using at least one: a time value obtained from wireless multipath signals between the MS and the corresponding collection of receivers, a signal strength value obtained from wireless multipath signals between the MS and the corresponding collection of receivers, a value indicative of whether there is a wireless communication between the MS and a receiver not in the corresponding collection of receivers, and a difference in wireless signal data between MS transmissions at different transmission powers.

228. (New) The method of Claim 223, wherein said step of identifying includes recognizing a pattern between (c1) and (c2).

229. (New) The method of Claim 222, further including performing said three steps of obtaining, deriving and storing repeatedly, wherein at least one performance of said three steps occurs prior to said step of activating and another performance occurs after said step of activating.

230. (New) The method of Claim 222, wherein at least some of said receivers are substantially co-located with base stations of a commercial mobile radio service provider (CMRS), wherein each of said base stations support two way voice communication with the mobile stations via a plurality antennas at said base station, and the two way voice communication is provided by one of the following wireless transmission techniques: CDMA, TDMA, GSM, AMPS, and NAMPS.

231. (New) The method of Claim 222, further including a step of receiving a request for locating the mobile station for one or more of:

(c1) locating a vehicle;

(c2) locating an emergency caller;

(c3) routing a vehicle;

(c4) locating a child;

(c5) tracking a vehicle; and

(c6) locating a parolee.

232. (New) An apparatus for locating a mobile station MS, of a plurality of mobile stations, using wireless signal data obtained from transmissions between said mobile station MS and a plurality of wireless receivers, wherein each said receiver is capable of wirelessly detecting said mobile stations, comprising:

a data repository for storing, for each of a plurality of known locations, a plurality of instances of (a1) and (a2) following:

(a1) a location representation of the known location, and

(a2) corresponding multipath information, wherein said corresponding multipath information is indicative of the wireless signal multipath at the known location;

a plurality of location estimators for determining one or more of location estimates of the mobile station MS, wherein (b1) – (b3) following:

(b1) for each said location estimator, there is a predetermined corresponding collection of one or more of said receivers from which the location estimator receives a corresponding input of wireless signal multipath data obtained from one of said mobile stations whose location is to be determined by the location estimator;

(b2) for determining locations of said mobile stations, each said location estimator is dependent upon (i) and (ii) following: (i) (a1) and (a2) of at least some of said instances, and (ii) multipath information from wireless signals communicated between the mobile stations and said predetermined corresponding collection of said receivers;

(b3) for each of said location estimators, said predetermined corresponding collection has at least one of said receivers that is different from said predetermined corresponding collection for a different one of said location estimators;

a resolver for determining from said one or more location estimates a likely location of the mobile station MS.

233. (New) The apparatus of Claim 232, wherein at least some of said receivers are substantially co-located with base stations of a commercial mobile radio service

provider (CMRS), wherein each of said base stations support two way voice communication with the mobile station MS via a plurality antennas at said base station, and the two way voice communication is provided by one of the following wireless transmission techniques: CDMA, TDMA, GSM, AMPS, and NAMPS.

234. (New) The apparatus of Claim 233, wherein at least some of said receivers are included within transceivers at said base stations, wherein said transceivers are able to support the two way voice communication with the mobile station MS.

C23 Cont.

235. (New) The apparatus of Claim 234 further including an output gateway for transmitting, on one of a public telephone switching network and the Internet, an output indicative of said likely location to a predetermined destination, wherein said output gateway performs one or more of:

(a) outputs said output in a format according to said predetermined destination;

(b) outputs said output according to a frequency for outputting said output; and

(c) determines said output by snapping said likely location to a transportation route.

236. (New) The apparatus of Claim 234, wherein said resolver includes:

a location predictor for predicting a subsequent location of the mobile station MS by accessing data indicative of at least one estimated path for the mobile station MS.

237. (New) The apparatus of Claim 234, wherein said resolver includes:

an evaluator for determining one or more of: (i) whether one of said location estimates implies that the mobile station MS has an excessive expected speed, (ii) whether one of said location estimates implies that the mobile station MS has an excessive expected speed for an area having said one location estimate, (iii) whether one of said location estimates implies that the mobile station MS has an excessive expected change in velocity; (iv) whether one of said location estimates implies that the mobile station MS is travelling a known transportation pathway.

238. (New) The apparatus of Claim 234, wherein said resolver includes:

an evaluator for determining a value indicative of a likelihood that the mobile station MS is at a corresponding one of said location estimates, wherein said evaluator determines said value as a function of a past performance of one of said location estimators that determined said corresponding one of said location estimates.

239. (New) The apparatus of Claim 234, wherein said resolver includes:

an evaluator for determining a value indicative of a likelihood that the mobile station MS is at a corresponding one of said location estimates, L, wherein said evaluator determines said value as a function of one of a similarity and a dissimilarity between one or more occurrences of said multipath data of (a2), wherein the known locations of (a1) for each occurrence of said multipath data is within an area represented by L or determined to be near L according to a predetermined criteria.

240. (New) A method for locating a land borne mobile station MS using wireless signal data obtained from transmissions between the mobile station MS and one or more of a plurality of land borne wireless communication stations, comprising:

receiving wireless signal data indicative of one or more wireless transmissions between the land borne mobile station MS at an unknown location and the communication stations, wherein the mobile station MS and the communication stations wirelessly receive and transmit to one another during an instance of locating the mobile station MS, and wherein during the instance, each, if any, intermediary device for assisting in transmitting wireless information between the mobile station MS and the communication stations is land borne;

first obtaining one or more values V, wherein each value V is indicative of a difference in arrival times of the wireless signals between: (i) the mobile station MS and some one of the communication stations, and (ii) the mobile station MS and a different one of the communication stations;

first determining one or more representations, R, of locations for MS from a first location technique, wherein the first location technique determines each representation R using at least one of the values V;

second obtaining one or more occurrences of directional data, wherein each occurrence of the directional data is indicative of an angular orientation about one of

the communication stations CS of a direction of the wireless transmissions to CS from the MS;

second determining one or more MS candidate locations using a second location technique, wherein the second location technique determines each of the candidate locations using at least one occurrence of the directional data, and wherein each value obtained that is indicative of an instance of one of the difference in arrival times of the wireless signals does not substantially affect the determination of at least one of the MS candidate locations;

determining a resulting location estimate of the mobile station MS using at least the one or more representations R, and at least one of the one or more MS candidate locations, wherein the resulting location identifies a location of the mobile station MS in a stationary coordinate system.

241. (New) The method of Claim 240, wherein at least one of the communication stations is co-located with a base station of a commercial mobile radio service provider (CMRS) that is in two way communication with the mobile station MS for receiving at least a portion of the transmissions for the instance of locating the mobile station MS.

242. (New) The method of Claim 240, wherein said step of first determining includes providing said at least one value V to a site remote from the mobile station MS for performing the step of first determining.

243. (New) The method of Claim 97, wherein at least one of said second and third techniques includes a step of determining a likely geographical location of the mobile station MS, wherein (d1) - (d3) following hold:

(d1) the step of determining is dependent upon multipath data of the corresponding input data, wherein the multipath data is obtained from wireless signal multipath information communicated between the mobile station MS and the communication stations,

(d2) the step of determining is dependent upon (i) and (ii) following: (i) a representation of each of a plurality of geographical locations and (ii) for each of the geographical locations, corresponding multipath information

previously obtained using transmissions between some mobile station and the communication stations, when the some mobile station transmited from approximately the geographical location,

(d3) the step of determining includes a step of selecting one or more of the geographical location representations that are likely to be approximate to the unknown location.

244.(New) The location system of Claim 111, wherein the one or more location estimators include at least one of the following techniques (a), and (c):

providing a plurality of requests for location information, each request related to a location of one of said mobile stations, to one or more mobile station location estimators such that when said location estimators are supplied with input data having values obtained from wireless signal measurements obtained via transmissions between said mobile stations and the transceivers, said one or more location estimators perform at least one of the following techniques (a), and (b):

(a) a first technique for determining a likely location of the mobile station MS, wherein (a1) - (a3) following hold:

(a1) the first technique is dependent upon multipath data of a first corresponding portion of said input data, wherein the multipath data is obtained from wireless signal multipath information communicated between the mobile station MS and the transceivers,

(a2) the first technique is dependent upon (i) and (ii) following: (i) a representation of each of a plurality of geographical locations and (ii) for each of the geographical locations, corresponding multipath information previously obtained using transmissions between some mobile station and the transceivers, when the some mobile station transmitted from approximately the geographical location,

(a3) the first technique selects one or more of the geographical location representations that are likely to be approximate to the mobile station MS;

(b) a second technique for determining a likely location of the mobile station MS, wherein said second technique includes the steps of (b1) and (b2) following:

(b1) calibrating, for each of a plurality geographical locations, (i) and (ii) following: (i) a representation of the geographical location with (ii) for the geographical location, corresponding multipath information indicative of multipath signals previously transmitted between some mobile station and the transceivers, when the some mobile station transmitted from approximately the geographical location;

(b2) determining one or more likely location estimates for MS by identifying a similarity between (i) and (ii) following: (i) multipath characteristics determined from wireless signals communicated between the mobile station MS and the transceivers, and (ii) the multipath information of (b1)(ii) for a collection of one or more of the geographical locations;

(c) a third technique for determining a likely location of the mobile station MS, wherein said third technique uses a statistical correlation for correlating (c1) and (c2) following:

(c1) values that are a function of at least one of: a signal strength and a signal time delay of wireless signals between said mobile station MS and the transceivers, and

(c2) information indicative of: a plurality of collections of wireless signal measurements, wherein for each said collection, there is a known location S where said collection is obtained from transmissions between said transceivers and some mobile station at the location S for said some mobile station;

wherein said correlation is used for determining that the mobile station MS is within a corresponding geographic area.

245.(New) The method of Claim 117, wherein the step of determining a resulting location includes performing a third technique for determining a likely location of the mobile station MS, wherein (a) - (c) following hold:

(a) the third technique is dependent upon multipath data of a third corresponding portion of said input data, wherein the multipath data is obtained from wireless signal multipath information communicated between the mobile station MS and the tranceivers,

(b) the third technique is dependent upon (b1) and (b2) following: (b1) a representation of each of a plurality of geographical locations and (b2) for each of the geographical locations, corresponding multipath information previously obtained using transmissions between some mobile station and the transceivers, when the some mobile station transmitted from approximately the geographical location,

(c) the third technique selects one or more of the geographical location representations that are likely to be approximate to at least one location of the mobile station MS.

246. (New) The method of Claim 121, further including the steps of:

providing communication between the mobile station and another party via at least one of the terrestrial stations, wherein the communication travels through a public switched telephone network;

requesting one or more of the location estimates in response to signals received from a commercial mobile radio system wirelessly communicating with the mobile station;

transmitting, via at least one of a public switched telephone network and the Internet, at least one location of the mobile station to one of: a public safety answering point, a police unit, and a party requesting the location of the mobile station.

247. (New) The method of Claim 121, wherein said two way communication between the mobile station and the terrestrial stations uses one of: CDMA, TDMA, GSM, NAMPS.

248. (New) The method of Claim 133, further including the steps of:

providing communication between the mobile station and another party via at least one of the communication stations, wherein the communication travels through a public switched telephone network;

requesting one or more of the location estimates in response to signals received from a commercial mobile radio system wirelessly communicating with the mobile station;

transmitting, via at least one of a public switched telephone network and the Internet, at least one location of the mobile station to one of: a public safety answering point, a police unit, and a party requesting the location of the mobile station.

249. (New) The method of Claim 137, further including the steps of:

providing communication between the mobile station and another party via at least one of the communication stations, wherein the communication travels through a public switched telephone network;

requesting one or more of the location estimates in response to signals received from a commercial mobile radio system wirelessly communicating with the mobile station;

transmitting, via at least one of a public switched telephone network and the Internet, at least one location of the mobile station to one of: a public safety answering point, a police unit, and a party requesting the location of the mobile station.

REMARKS

Objections to Claims 139, and 159-162.

Regarding the Examiner's objections to Claim 139, Applicants have modified this claim so that the term "combination of one or more" is now – collection of one or more --. The

Examiner also stated that "combination of one or more of (a) through (c)" is unclear suggesting that the "(a) through (c)" should – (a) through (d) --. It is believed that this objection has been overcome in that the paragraph corresponding to the label "(d)" has been deleted. Accordingly, it is believed that Claim 139 is now in condition for allowance.

Regarding the Examiner's objection to Claim 159, "(B4)" has been changed to – (B3) – as the Examiner indicated. Accordingly, is it believed this claim is now in condition for allowance. Additionally, since Claim 159 is believed to now be in condition for allowance, as per the Examiner's comments, it is believed that Claims 160-162 are also in condition for allowance in that these latter claims are dependent on Claim 159.

Additional amendments to the Claims.

A number of the claims have been voluntarily modified to better describe what Applicant's believe to be the novel aspects of their invention. In particular, most of the modifications narrow the scope of the claims. Applicant's believe such narrowing is prudent to, e.g., protect Applicant's claim coverage from prior art that is currently UNKNOWN but may subsequently come to light. Further note some claims have also broadened. However, it is believed that such broadening is well within the scope of the novel aspects of the invention. Thus, it is believed that Claims 85 – 179 are in condition for allowance.

New Claims.

New Claims 180 to 245 have been added. Of these new claims, Claims 180, 182 – 202, and 240 – 245 are dependent upon previously allowed (or only objected to) Claims 85 – 179. Accordingly, it is believed these new claims are allowable at least due to their dependence on believed allowable Claims 85 – 179.

Regarding new Claim 180, this claim recites a "location estimate adjuster" for generating an additional mobile station MS location estimate from an initial location estimate generated by a mobile station location estimator. The additional location estimate is determined using other location estimates previously generated by the same location estimator that generated the initial location estimate. Moreover, it is also recited in this claim that such previously generated "other" location estimates of a mobile station have corresponding "known

locations", and that these known locations are also used in generating the additional location estimate. It is believed that this location estimate adjuster in combination with the other features recited in Claim 181 are particularly novel and patentable.

Regarding new independent Claim 203, this claim recites a method of providing a plurality of mobile station location estimators for estimating a location of a mobile station. For each of the location estimators, their mobile station location estimates are dependent upon multipath information from wireless signals communicated between the mobile station and a predetermined collection of receivers that are capable of wirelessly detecting mobile stations. Moreover, this claim also states that for at least two of the location estimators, their corresponding collections of receivers are different. It is believed that at least these aspects make this claim patentable over all known prior art. Moreover, should the Examiner determine that there is prior art to the filing date of the present application, the Examiner is invited to review the additional enclosed documentation related to this claim in **U.S. Provisional Patent Application No. 60/025,855 filed Sept. 9, 1996** (also denoted herein as the '855 Application) from which the present application claims benefit. In particular, this provisional patent application describes multiple location estimators (e.g., neural network based location estimators) whose mobile station location estimates (denoted as "First Order Models" or "FOMs" therein) are dependent on multipath wireless signals and wherein there is a substantially different set of (base station) receivers from which at least two of the location estimators receive multipath signal data. Since the enclosed provisional application is lengthy, Applicants have yellow tagged and highlighted portions of this provisional that are applicable to the present claim. In particular, the following portions of the '855 Application are noteworthy: page 17, the last paragraph, through page 18, line 12; page 79 from the heading "Neural Net With Genetic Adaptation Model" (line 11) to just before the heading "Coverage Area Determination" (line 31); page 80, lines 27-29; page 81, the first full paragraph; and Fig. NN-9.

New Claims 204–225 and 228-231 are dependent upon Claim 203 (either directly or via an intermediate claim). Accordingly, it is believed that these claims are also patentable at least due to their dependence upon Claim 203.

Regarding new independent Claim 226, this claim recites a method for locating a mobile station having a plurality of location estimators, wherein each of the location estimators uses multipath signals for identifying a similarity with stored multipath information, and, for each of the location estimators, the collection of receivers from which it receives input is different from the collection of receivers for another one of the location estimators. It is believed that this claim is patentable for similar reasoning as for Claim 203.

New Claim 227 is dependent upon Claim 226 and accordingly is believed to be patentable at least due to this dependence.

Regarding new independent Claim 232, this claim recites an apparatus for locating a mobile station (MS) including:

(a) a data repository having location representations, and for each of the locations, corresponding multipath information obtained from the location,

(b) a plurality of location estimators for determining the location of the mobile station MS, wherein in determining a location of a mobile station, each of the location estimators use multipath data from the mobile station being located as well as multipath information in the data repository. Moreover, for each of the location estimators, the collection of receivers from which the location estimator receives multipath data input from the mobile station is different from such a collection of receivers for a different one of the location estimators,

(c) a resolver for determining a likely location of the mobile station MS from the one or more location estimates obtained from the plurality of location estimators.

It is believed that Claim 232 is patentable over all known prior art. Moreover, as with Claims 203 and 226, the U.S. Provisional Patent Application '855 included herein describes each of the features (a)-(c) above. For example, one enablement of this claim in the '855 Application is the following:

(i) the data repository can be the location signature data base (described, e.g., in red tagged Figs 3.1 and. 4, these figures being substantially equivalent to Figs 6 and 8 of the present application), or more particularly, the Neural Net Training Data Base (Fig. 3.1). Other passages in the specification are also

tagged in red (i.e., page 18, lines 1-13; and page 80, lines 27-29) provide additional support,

(ii) the plurality of location estimators can be the neural network based FOMs discussed hereinabove, and

(iii) the resolver can be the hypothesis evaluator (shown in Fig. 3.1, and a brief discussion provided in the '855 Application commencing at the orange tag on page 102, line 28 proceeding to page 105, line 3).

Additionally, note that there are other enablements of Claim 232; in the '833 Application, including interpreting at least some of the plurality of location estimators as a neural network based FOM in series with the context adjuster (Figs 3.1 and 4, and page 54, line 4 to line 31, and page 106, line 7 to page 107, line 18).

New Claims 233-239 are dependent upon Claim 232 and accordingly are believed to be patentable at least due to this dependence.

Regarding new independent Claim 240, this claim recites the use of two techniques for determining the location of a land borne mobile station (MS), wherein a first technique determines a difference in arrival times of wireless signals communicated between the MS and a communication station, and, a second technique for determining the MS location which uses directional data indicative of an angular orientation about one of the communication stations for determining a candidate location(s) of the mobile station MS. Moreover, the candidate location(s) are determined by the second location technique such that "each value obtained that is indicative of an instance of one of the difference in arrival times of the wireless signals does not substantially affect the determination of at least one of the MS candidate locations". Finally, a resulting location estimate of mobile station MS is determined using at least one location output from each of the two location techniques. It is believed that no known prior art provides this combination of steps. Moreover, it is believed that the prior art provides no suggestion of performing this combination of steps for locating a land borne mobile station.

Further note that Claim 240 is believed to be enabled by '855 Application. In that the '855 Application describes a "mobile base station" (MBS) having a direction determining antenna therein for determining "directional data" indicative of an angular orientation about

the MBS (e.g., page 132, lines 24-28). Moreover, the MBS communicates mobile station (MS) location information to a location center so that the location of the MS can be further refined using, e.g., a wireless signal time difference of arrival technique (FOM) (see Fig. 4 of the '855 Application, wherein the "MOBILE BASE MODEL" and the "DISTANCE MODEL" are shown).

Additionally, note that also included herewith is a U.S. Disclosure Document having **Document Disclosure No. 378766, filed June 8, 1995**, wherein the immediately above described features for Claim 240 are also illustrated. In particular, page 1 of the Document Disclosure is a figure showing substantially the same architecture for a location center (denoted a "Location System" or "LS" in the Disclosure Document) as is also shown in Fig. 4 of the '855 Application, and also shown in Fig. 8 of the present application. Note that in each of these figures there is both a "DISTANCE MODEL" and a "MOBILE BASE STATION MODEL" for determining the location of a mobile station (which is referred to in the Disclosure Document as a "location unit" or "LU"). Moreover, page 2, paragraphs 9 and 10 discuss the obtaining of "direction data", and page 4, lines 13-15 has a pseudo-code command, "SEND any new location data related to the location of the LU" for sending such information to the "LS" (i.e., the Location System of page 1).

A check in the amount of $1,617.00 is enclosed as payment of: (a) $345.00 for a Request for Continued Examination (RCE), (b) $435.00 for a Request for a Three (3) Monthe Extension of Time, and (c) $837.00 for the fees for the additional 6 independent claims and the additional 62 dependent claims. It is believed that no further fees are due with this Amendment and Response. However, in the event that additional fees are due, please contact the Applicant named hereinbelow by phone preferably as soon as possible (phone numbers being: 303-863-2975 and/or 303-2730267).

Applicants respectfully submit that the claims are in condition for allowance and request the Examiner's favorable consideration and passage to issuance thereof.

Respectfully submitted,

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